(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 676 279 A1**

(12) **EUROPEAN PATENT APPLICATION published in accordance with Art. 158(3) EPC**

(21) Application number: **93911972.3**

(22) Date of filing: **06.05.93**

(86) International application number: **PCT/JP93/00595**

(87) International publication number: **WO 94/26508 (24.11.94 94/26)**

(51) Int. Cl.[6]: **B30B 13/00**, B30B 15/02, B21D 37/00, B21D 28/14, B21D 35/00

(43) Date of publication of application: **11.10.95 Bulletin 95/41**

(84) Designated Contracting States: **DE FR GB**

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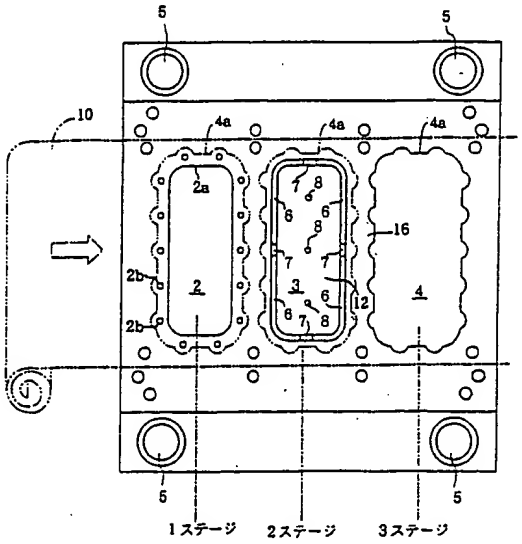
(54) **PRESS FORWARDLY FEED DIE OF METALLIC GASKET.**

(57) In a press forwardly feed die of metallic gasket wherein a convex bead forming die (3) for forming a convex bead (10b) surrounding a sealed portion is parallely provided between a metallic plate piercing die (2) and an outer contour punching die (4), a plurality of slits (6) each having a predetermined width corresponding to a width of a convex member (18) are equidistantly formed in the convex bead forming die (3) on the female side along a pressing line which is opposed to the convex member (18) on the male side, which is provided for press forming the convex bead (10b) on a metallic plate (10) forwardly fed after subjected to a predetermined piercing by the piercing die (2), and connecting grooves (7) having a depth necessary for bead forming by the convex member (18) and having the same width as the slit (6) are respectively formed between the slits (6).

FIG. 1



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TECHNICAL FIELD

The present invention relates to a die for molding a metallic gasket which is interposed between joining surfaces of a cylinder head and a cylinder block of an internal combustion engine and is fastened by a bolt.

PRIOR ART

As dies for molding a metallic gasket which is interposed between joining surfaces of a cylinder head and a cylinder block of an internal combustion engine and is fastened by a bolt, there have been heretofore developed a die used for a processing method by way of a single step which comprises the steps of piercing and blanking each gasket by means of a single blank piercing die and thereafter beading, and a progressive beading die which comprises piercing, beading and blanking a metallic gasket by way of progressive stamping of a web-like metallic plate.

Figs. 5(a) and 5(b) are respectively sectional views showing essential parts of a conventional press progressive beading die. In Figs. 5(a) and 5-(b), an upper bead in-peripheral base plate 11 is secured to an upper holder 14a on the male side, and a convex member 18 having a predetermined pressing line for forming a convex bead is fixedly mounted in the outer periphery of the upper bead peripheral base plate 11 in such a way that the convex member 18 is projected through a predetermined width. Further, a stripper 15 adjusted in height through a stopper 17 is provided in the outer periphery of the convex member 18 in the state where the stripper 15 is resiliently urged in a pressing direction through a spring 22 relative to the upper holder 14a.

On the other hand, on a lower holder 14b on the female side, a lower bead in-peripheral base plate 12 is fixed internally and a die 16 is fixed externally, boring a slit 19 having a predetermined width according to the pressing line of the convex member 18 on the male side.

These stripper 15 and the die 16 are juxtaposed to a blanking die in the press progressive die. A blanking punch 20 is fixedly mounted on the upper holder 14a while being juxtaposed to the stripper 15. The die 16 and the lower holder 14b are formed with blanking holes 21 for receiving a blanking punch 20. In the pressing of the blanking punch 20, the blanking punch 20 moves into the blanking hole 21 to provide a predetermined configuration of a metallic gasket in accordance with a boundary line.

In such a convex beading die as described above, in the pressing and molding, the convex member 18 causes a metallic plate 10 to press into the slit 19 to form a convex bead 10b.

The lower bead in-peripheral base plate 12 is set to have the same level as the die 16. The upper bead in-peripheral base plate 11 is set to have the same level as the stripper 15. The piercing, the beading and the blanking of the metallic gasket can be subjected to the collective progressive stamping of a web-like metallic plate. At this time, the pressure contact between the pair of upper and lower bead in-peripheral base plates 11 and 12 to press and mold a bead in-peripheral flat plate portion 10a of the metallic gasket, the stripper 15 always resiliently keeps the surface pressure between the former and the die 16 by the urging force of the spring 22 to prevent the occurrence of struggle and creases of a bead out-peripheral flat plate portion 10c and to press and mold the bead out-peripheral flat plate portion 10c as a part of a beading die.

However, in the progressive convex beading die as described above, the die 16 is merely secured in the state independently of the lower die bead base plate 14b in a narrow range between the slit 19 and the blanking hole 21, and is always in the state of being short of strength.

In the drawing of the convex bead 10b, the convex member 18 presses a bead part of the metallic gasket against the slit 19 in a direction as indicated by the arrow in Fig. 5(a). As a result, the width of the slit 19 between the lower bead in-peripheral base plate 11 and the die 16 is forced open. For this reason, the die 16 is flexed toward the blanking hole 21. When moving down, the blanking punch 20 comes to contact with the corner of the die 16, resulting in a nicked edge. Or, the die 16 flexed on the side of the blanking hole 21 leads to a poor blanking against the blanking punch 20.

Further, as shown in Fig. 5(b), the die 16 is flexed in a direction of the slit 19 as indicated by the arrow by the pressing force of the blanking punch 20. Because of this, the width of the convex bead 10b becomes unstable.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a press progressive die for a metallic gasket, which overcomes a short of strength of a die peculiar to a progressive convex beading die, so as to achieve the smooth press progressive beading.

In the press progressive die for a metallic gasket according to the present invention, a convex beading die for forming a convex bead encircling a seal part is disposed between a piercing die and a blanking die of a metallic plate. A plurality of slits having a predetermined width corresponding to a width of a convex member are bored in spaced

relation on a convex beading die on the female side along the pressing line opposite to a convex member on the male side provided to press and mold a convex bead on a metallic plate which has been subjected to predetermined piercing by means of a piercing die. A connecting groove having a depth required to mold a bead by the convex member is bored in the same width as that of the slit between the slits. The top portion of the connecting groove may be formed into a curved angle shape.

On the female side of the beading die, a plurality of slits are partly provided along the pressing line opposite to the convex member on the male side for molding a bead. A connecting groove having a depth required to mold a bead by the convex member is bored between the slits. Thereby, the lower bead in-peripheral base plate and the die are connected integral with each other. The lower bead in-peripheral base plate is fastened to the lower holder by means of a bolt. Then, the lower die is also fastened to the lower holder by a bolt to constitute a rigid structure. The rigidity of the die itself is enhanced. Further, locating of the die is made simultaneously with locating of the lower bead in-peripheral base plate.

When the connecting grooves are formed over the whole periphery of the slits, the dregs tends to stay therein. However, if the connecting grooves are limited to required locations and the tops thereof are formed into the curved angle shape, the dregs can be slipped out of the connecting grooves.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a plan view of a female die pressing surface of a press progressive die according to one embodiment of the present invention.

Fig. 2 is a schematic perspective view of the female die shown in Fig. 1.

Figs. 3(a) to 3(b) are respectively perspective views showing a P portion in Fig. 2 showing a processing method of a beading die according to the present invention. Fig. 3(a) represents the state where slits other than connecting grooves are processed by a wire cutter or the like. Fig. 3(b) represents the state where a top of the connecting groove is cut off by a discharge processing or the like. Fig. 3(c) represents the state where a top of the connecting groove is cut off into a curved angle shape by a discharge processing . Fig. 3(d) shows a section taken along the C1-C1 in Fig. 3(a). Fig. 3-(e) shows a section taken along the C2-C2 in Fig. 3(b). Fig. 3(f) shows a section taken along the C3-C3 in Fig. 3(c).

Fig. 4(a) is a sectional view taken along A-A in Fig. 2.

Fig. 4(b) is a sectional view taken along B-B in Fig. 2.

Figs. 5(a) and 5(b) are respectively sectional views showing essential parts of the conventional beading die.

DETAILED DESCRIPTION OF THE EMBODIMENTS

The embodiment of the present invention will be described hereinbelow with reference to the drawings.

The press progressive die has a female die pressing surface 1. A beading die 3 is disposed between a piercing die 2 and a blanking die 4. On four corner portions of the die 3 are disposed guide bushes 5 for guiding a guide post of a male die.

In the piercing die 2, numeral 2a denotes a piercing line, and 2b denotes a bolt removing hole. In the blanking die 4, numeral 4a designates a blanking line.

As shown in Figs. 4(a) and 4(b), on the male side of the beading die 3 is disposed a convex member 18 according to the molding line of a convex bead 10b to be formed in the outer periphery of a pierced metallic plate 10. The convex member 18 is projected to be suspended from a stopper 7 laid on an upper holder 14a through a high rigid spacer 19. To the inner periphery of the convex member 18 is secured an upper bead in-peripheral base plate 11 through the spacer 19 and the stopper 17 by means of a bolt 9. A projecting height of the convex member 18 is set to be projected downward by a height of the convex bead 10b to be formed from a pressing surface 11a of the upper bead in-peripheral base plate 11.

In the outer periphery of the convex member 18 is laid a stripper 15 through a spring 22 suspended from the upper holder 14a. The stripper 15 slidably moves vertically relative to the blanking punch 20 of the blanking die 4 and the convex member 18. The stripper 15 is normally urged downward by the force of the spring 22 to place its pressing surface 15a above the same level as that of the pressing surface 18a of the convex member 18. When the metallic plate 10 is pressed, the stripper 15 is urged upward against the force of the spring 22.

When the stripper 15 comes to contact with the stopper 17 through the spacer 19, a pressing surface 15a of the stripper 15 assumes the same level as that of the pressing surface 11a of the upper bead in-peripheral base plate 11.

On the other hand, on the female side of the beading die 3 are bored a plurality of slits 6, in spaced relation, having a predetermined width, corresponding to a width of the convex member 18 partly along the pressing line on the convex bead-

ing die 3 on the female side opposite to the convex member 18 on the male side. A connecting groove 7 having a depth required to mold a bead by the convex member 18 is formed between the slits 6. The connecting grooves 4 are disposed in positions obtained by equally dividing the slits 6 into four portions. However, for example, two connecting grooves 7 may be provided in each long side.

On the female side of the beading die 3 are formed slits 6 according to the width of the convex bead 10b having a sectional shape as shown in Fig. 4(a) partly according to the pressing line of the convex member 18. The connecting groove 7 has a sectional shape as shown in Fig. 4(a). The lower bead in-peripheral base plate 12 and the die 16 are connected integral with each other by the connecting grooves 7. Since the lower bead in-peripheral base plate 12 is secured to the lower holder 14b by the bolt 8, the die 16 is also secured to the lower holder 14b by locating the lower bead in-peripheral base plate 12.

The processing method for the slit 6 having the connecting groove 7 in the above-mentioned embodiment will be described hereinbelow. As shown in Figs. 3(a) and 3(b), a die material subjected to heat treatment and both-sides grinding is first bored with slits 6 by a wire cutter or the like in the state (7a) where the connecting grooves 7 are left flat. Next, as shown in Figs. 3(a) and 3(b), the top of the connecting groove 7 is shaved off by the discharge processing or the like in consideration of the projecting amount of the convex bead 10b. Further, as shown in Figs. 3(c) and (f), the top of the connecting groove 7 is formed into a curved angle shape (7b) so as to have the shape in which the dregs on the connecting groove 7 are slipped off.

When a resilient metallic plate or a metallic plate 10 having a rubber coating applied thereto is progressively fed to a predetermined position and the lower holder 14b is moved down, a convex bead 10b is formed, in a predetermined bead line, on the metallic plate 10 by the pressing of the convex member 18. An in-peripheral flat plate portion 10a of the bead is pressed andformed by the pressure contact between a pair of upper and lowerbead in-peripheral base plates 11 and 12. The stripper 15 always resiliently maintains the surface pressure relative to the die 16 by the urging force of the spring 22. Thereby, the struggle and creases of an out-peripheral flat portion 10c of the bead can be prevented from their occurrence. Further, the out-peripheral flat portion 10c of the bead is pressed and formed as a part of the beading die.

In the pressing of the blanking punch 20, the blanking punch 20 moves into the blanking hole 21. As a result, a predetermined configuration of a metallic gasket is blanked in accordance with the blanking line 4a relative to the die 16.

According to the above-mentioned press progressive die, the die 16 can be connected integrally to the lower bead in-peripheral base plate 12 by the connecting grooves 7 which are disposed in several locations of the slits 6. This improves the rigidity of the die 16. The slit width is also prevented from being forced open. There can overcome a short of strength of the die 16 which has been a problem peculiar to the press progressive die in which the blanking die 4 is provided closely to the convex beading die 3. A further stage has been heretofore provided as a play between stage 2 and stage 3 on the female side of the progressive die (see Fig. 1) in order to obtain the rigidity of the die 16. However, this need not be provided according to the present invention. Accordingly, this is effective in miniaturization of the press progressive die.

Further, the lower bead in-peripheral base plate 12 is fastened to the lower holder 14b by the bolt and at the same time the die 16 is located. Thereby, the locating work and means for the die 16 are not required.

Further, since the connecting grooves 7 are limited to be disposed at locations of the slits 6 as required, the top thereof is formed into a curved angle shape, whereby the dregs can be slipped off from the connecting groove 7.

In case of the progressive die, the hole and internal shape blanking step, the bead forming step and the external shape blanking step are carried out in said order. Due to the presence of the piercing step before the bead forming step, for example, the dregs in the piercing are sometimes abhered to material owing to some conditions. When this the dregs are fed to the beading step, the dregs are fallen into the bead recess groove located in the lower die (on the die side). If this groove is of the overall peripheral type connecting groove, the dregs are stayed in the groove successively. Because of this, scratches tend to occur on the concave head of the bead. However, according to the present invention, the slits and the connecting grooves are employed, and the staying of the dregs through a thickness portion of die material can be avoided. Even if the dregs should be fallen into the partial groove, it would be dropped into the suit due to the presence of the slits and the connecting grooves. Thereby, the above-mentioned trouble can be avoided.

Claims

1. A press progressive die for a metallic gasket a convex beading die (3) for forming a convex bead (10b) surrounding a seal part is disposed between a piercing die (2) for a metallic plate

and an external shape blanking die (4); characterized in that a plurality of slits (6) having a predetermined width corresponding to a width of a convex member (18) is bored in spaced relation on the convex beading die (3) on the female side along the pressing line opposite to a convex member (18) on the male side provided to press and mold said convex bead (10b) on a metallic plate which has been subjected to predetermined piercing by mean of said piercing die (2) and progressively fed, and connenting grooves (7) having a depth required to mold a bead by said convex member (18) is bored in the same width as that of the slit (6) between the slits (6).

2. The press progressive die for a metallic gasket according to claim 1, wherein a top portion of said connecting groove (7) is formed into a curved angle shape.

3. The press progressive die for a metallic gasket according to claim1, wherein a top portion of said connecting groove (7) is formed into a flat shape.

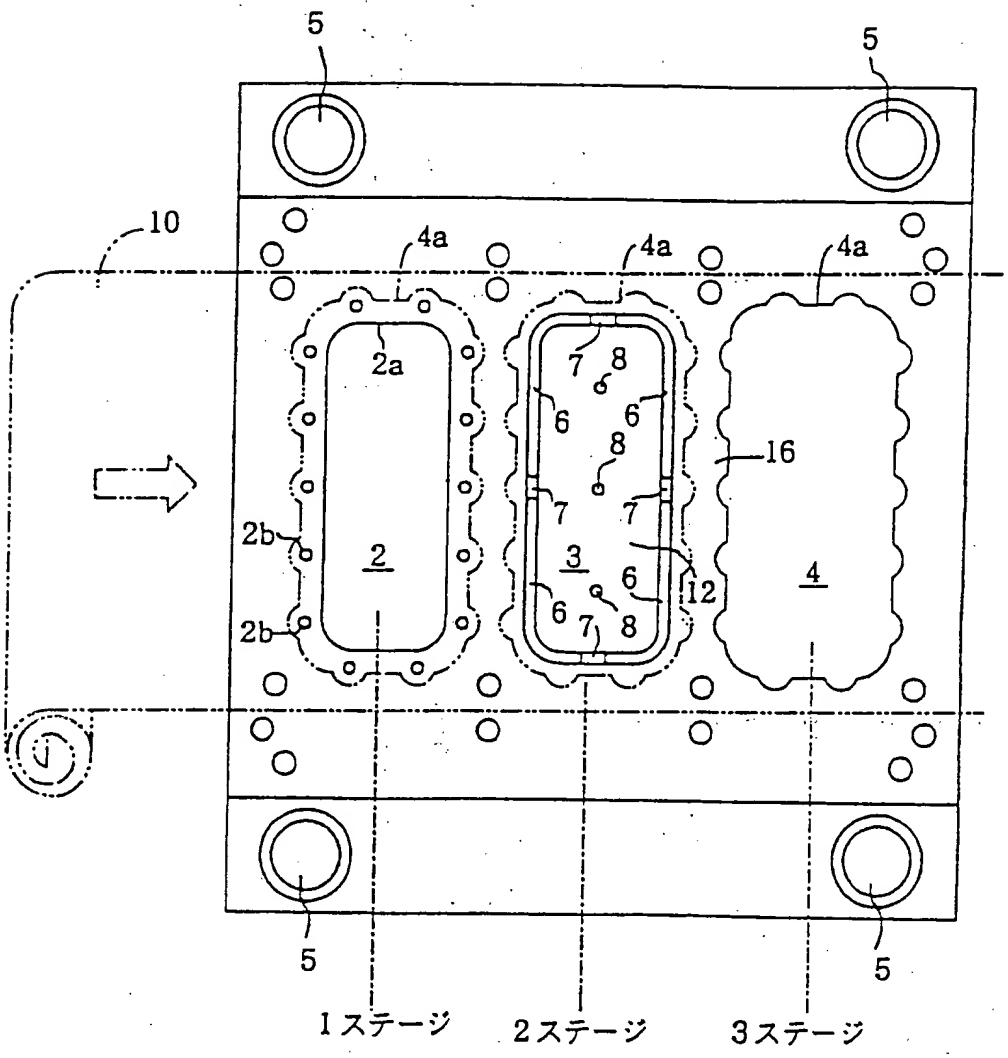
4. The press progressive die for a metallic gasket according to claim 1, wherein said slits (6) are arranged along substantially rectangular shape.

5. The press progressive die for a metallic gasket according to claim 1, wherein four of said slits (6) are arranged along a substantially rectangular shape.

6. The press progressive die for a metallic gasket according to claim 5, wherein four connecting grooves (7) are arranged at opposite positions which equally divide said slits (6) into four.

7. The press progressive die for a metallic gasket according to claim 5, wherein said connecting grooves (7) are arranged at two locations on each of long sides of said rectangle.

FIG. 1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4a
4a
2a
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1ステージ
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FIG.2

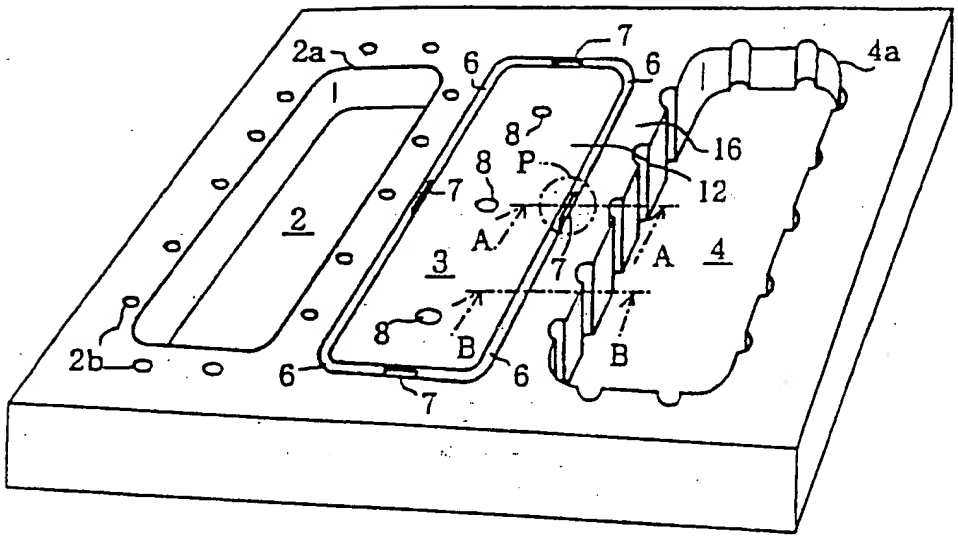
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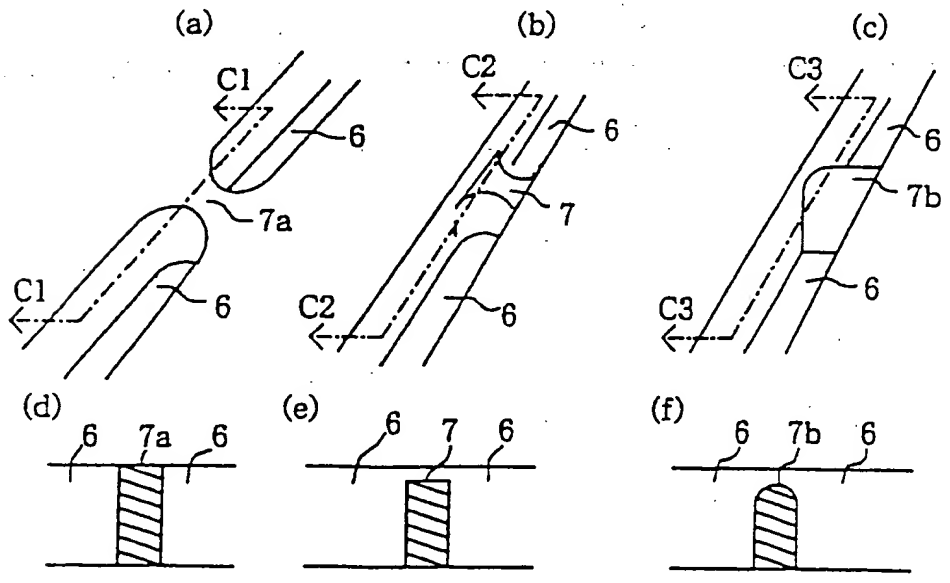
FIG.3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C1
6
7a
C1
6
(b)
C2
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C2
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(c)
C3
6
7b
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(e)
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(f)
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6

FIG.4

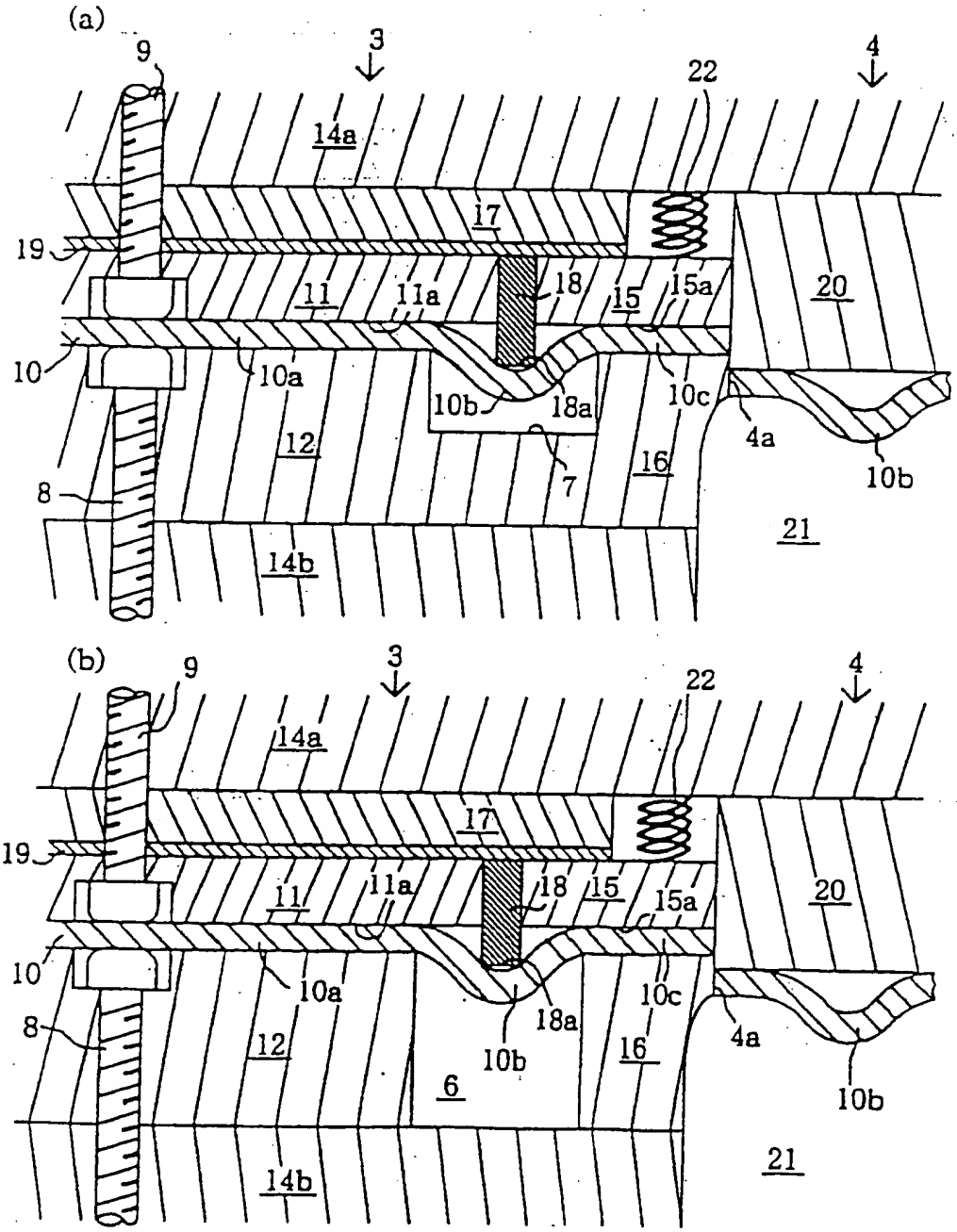
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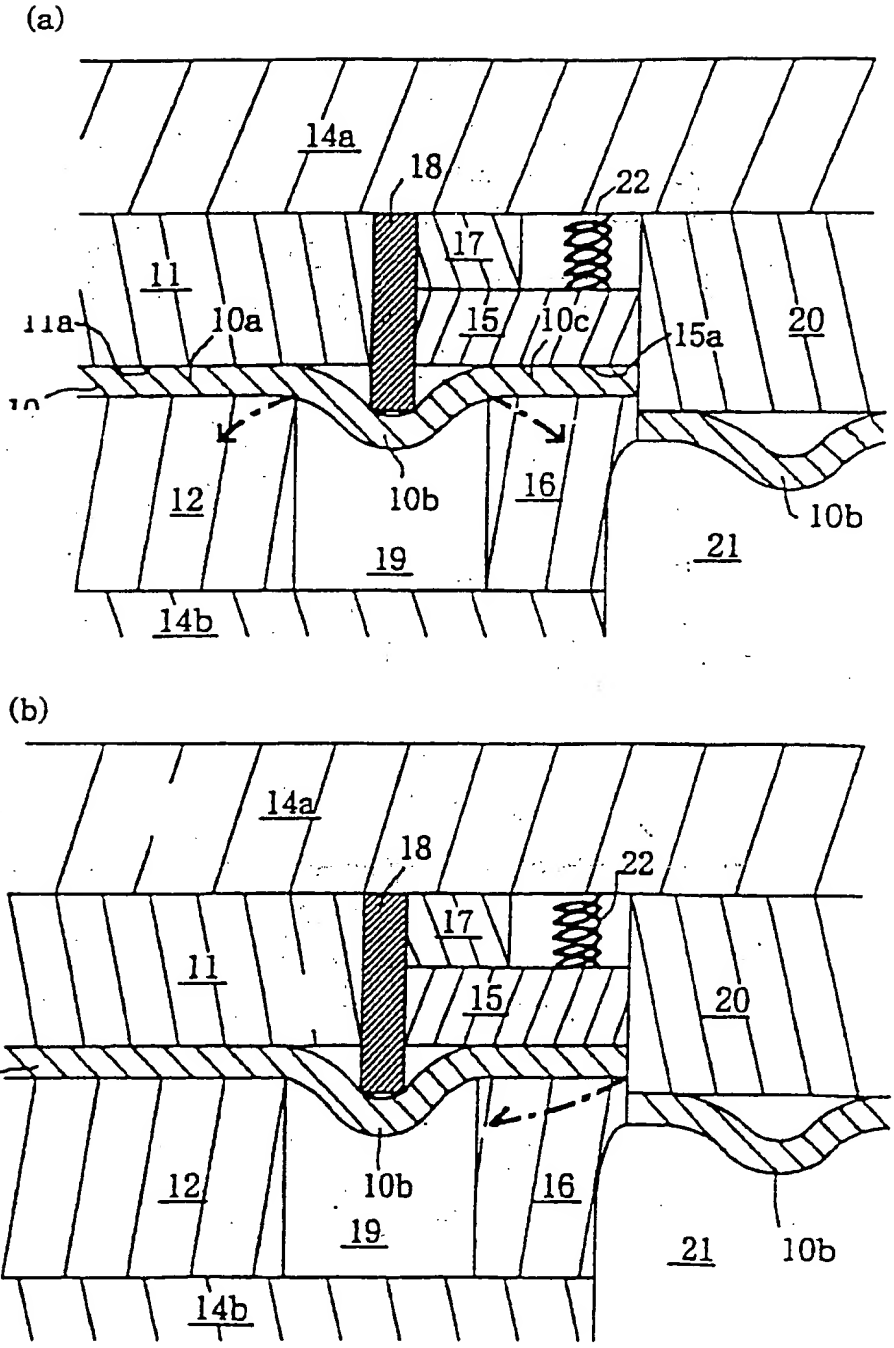
FIG.5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10b
14b

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP93/00595

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl^5 B30B13/00, 15/02, B21D37/00, 28/14

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Int. Cl^5 B30B13/00, 15/02, B21D37/00-37/20, 28/00-28/36

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Jitsuyo Shinan Koho 1926 - 1993
Kokai Jitsuyo Shinan Koho 1971 - 1993

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP, A, 51-13366 (Kawabe Kinzoku Seisakusho K.K.), February 2, 1976 (02. 02. 76), Line 12, lower right column, page 1 to line 1, upper left column, page 2 (Family: none)	1-7
A	JP, A, 61-103627 (Toyota Motor Corp.), May 22, 1986 (22. 05. 86), Line 14, lower right column, page 1 to line 11, upper left column, page 2 (Family: none)	1-7

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:
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"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
July 28, 1993 (28. 07. 93)	August 17, 1993 (17. 08. 93)
Name and mailing address of the ISA/ Japanese Patent Office	Authorized officer
Facsimile No.	Telephone No.

Form PCT/ISA/210 (second sheet) (July 1992)